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October 18, 2016

Carlisle Zoning Board of Appeals
c/o Travis Snell
Zoning Board of Appeals, Chair
66 Westford Street
Carlisle, MA 01741

RE: Nitsch Project #10399
Peer Review
Comprehensive Permit – 40B
100 Long Ridge Road
Carlisle, MA

Dear Mr. Snell:

Nitsch Engineering has reviewed the project known as the "The Birches – 40B" located at 100 Long Ridge Road in Carlisle, Massachusetts for soundness of methodology, calculation, and conformity to standard engineering practice as requested. Nitsch Engineering's comments are intended to assist the Zoning Board of Appeals (ZBA) in understanding the proposed project, identifying technical issues related to the site development, and making recommendations to the ZBA of possible technical improvements to the proposed design. Nitsch Engineering's original review of this project was dated October 24, 2014. Nitsch Engineering's last review of this project was dated April 17, 2015.

Nitsch Engineering downloaded the following plans and documents from the Town of Carlisle (the Town)'s website:

1. Plan entitled "Fire Turning Exhibit for Plan P – The Birches, 100 Long Ridge Road, Carlisle, MA," prepared by Meisner Brem Corporation, dated February 2, 2016.
2. Plan entitled "Plan P – Public Water Supply Utility – The Birches, 100 Long Ridge Road, Carlisle, MA," prepared by Meisner Brem Corporation, dated February 2, 2016.
3. A memo entitled "40B Remand Hearing for 100 Long Ridge Road – Additional Comments," prepared by the Planning Administrator George Mansfield, dated August 11, 2016.
4. A memo entitled "Plan P, The Birches, 100 Long Ridge Road," prepared by the Conservation Administrator Sylvia Willard, dated February 2, 2016.
5. A memo entitled "Lifetime Green Homes 40B Proposed Project Changes," prepared by the Board of Health, dated September 8, 2016.
6. An e-mail with a list of comments on The Birches Plan, dated February 2, 2016, from Carlisle Fire Chief David Flannery to the Carlisle ZBA.
7. A letter to Stamski and McNary from the Department of Environmental Protection (DEP) entitled, "Request for Clarification-Groundwater Mounding Analysis and Pressure Distribution," dated July 25, 2006.
8. A letter entitled "Summary of Plan Changes – The Birches," dated August 3, 2016 prepared by Lifetime Green Home, LLC.
9. A letter to the Carlisle ZBA entitled "The Birches, Application for Comprehensive Permit, Remand from HAC," dated August 23, 2016 prepared by Lifetime Green Home, LLC.
10. A table clarifying the total number of bedroom units at The Birches, uploaded to the Town ZBA web page on August 30, 2016.

11. Attachment A – The Birches Title 5 310CMR 15.217 Equivalency Calculations uploaded to the Town ZBA web page on August 23, 2016.
12. Stormwater Management Report for Plan P, Volume 1 of 2, prepared by Meisner Brem Corporation, revised August 19, 2016.
13. Stormwater Management Report for Plan P, Volume 2 of 2, prepared by Meisner Brem Corporation, dated August 19, 2016.

The septic system and drinking water supply wells will be permitted through DEP and peer reviewed by another consultant contracted through the ZBA.

Nitsch Engineering understands that the Applicant has received an Order of Conditions for the original layout and design from the Town Conservation Commission under the Notice of Intent (NOI) (DEP file No. 125-0974) for review. The original hearing for this project was opened by the Town Conservation Commission on August 1, 2014.

Nitsch Engineering reviewed the proposed project under the Wetlands Protection Act (WPA), the Massachusetts Department of Environmental Protection (MassDEP) Stormwater Management Standards, and the Town Rules and Regulations where appropriate, as summarized in the comments below.

SITE AND PROJECT DESCRIPTIONS

1. Summary of Existing Conditions

The 9.84-acre project site is located at 100 Long Ridge Road and consists of one (1) lot. The site currently contains one (1) residential home and a horse farm. Approximately 4.5 acres of the site are cleared/developed and the remainder is woods or wetlands. An intermittent stream and associated Bordering Vegetated Wetland (BVW) cross through the eastern portion of the site. The BVW has been flagged and shown on the overall site plan. The project site is located east of the Blood Farm Trail, which is part of the extensive Carlisle trail system and leads to the Davis Corridor and Estabrook Woods.

The topography in the developed portion of the site along the existing driveway and near the home and barn is relatively flat. Moving eastward from the developed area, the topography slopes down, steeply in places, to the intermittent stream and associated BVW.

There is an existing private water supply well and septic system that service the existing residential home. Electric service is provided to the existing home by NStar through the underground wiring and the transformer located in the southwest corner of the site near Long Ridge Road. There is also underground cable service provided by Comcast.

2. Summary of Proposed Conditions

The Applicant is seeking a revision of the Comprehensive Permit from the Town ZBA, pursuant to Massachusetts General Law Chapter 40B, to construct 19 new housing units on a 1,160± linear foot dead-end roadway. There will be 20 units in total, including the existing home that will remain, for a density of 2.03 units per acre. In General Residence District B, the Carlisle Zoning Bylaw requires a lot size of 2 acres with one (1) unit per lot (or a density 0.5 units per acre). The proposed 20-foot wide private roadway will be located approximately 110 feet east of the intersection of Long Ridge Road and Garnet Rock Lane. The roadway ends about 500 feet into the site with a cul-de-sac. The driveway/roadway continues for another 200 feet, which provides access for six (6) of the proposed

units (#13-#18). At the end of the drive there is a gravel turn around for emergency vehicles. The gravel access driveway continues into the site and crosses the wetland to provide access for three (3) wells on the east side of the site. The access road continues behind Unit 16 to provide access to wells on the west side of the wetland.

Domestic water service will be provided by seven (7) new drinking water supply wells in addition to the existing well. The wells will be considered a Zone I Public Water Supply (PWS) and will be permitted by DEP. The Applicant is providing one (1) water tank for both fire suppression and domestic use. The Applicant is proposing three (3) new septic systems to provide sewage treatment for the new units. Each septic system will receive 1,980 gallons per day (gpd). The Applicant proposes to manage stormwater generated by the proposed project through a combination of Low Impact Development (LID) techniques and conventional stormwater strategies.

PERMITTING

3. The project does not appear to require review under the Massachusetts Environmental Policy Act (MEPA). Nitsch Engineering recommends that the Applicant confirm whether or not this certificate will be required.
4. Nitsch Engineering recommends that the Applicant verify with the Army Corps of Engineers that a Category I or II permit is not required for the proposed work within jurisdictional wetland resource areas (wetland crossing). Also, Nitsch Engineering recommends that the Applicant verify with MassDEP whether a Water Quality Certificate is required for this project.
5. The Existing Conditions Plan from previous submittals indicates an intermittent stream and associated BVW in the eastern portion of the project site. The 100-foot buffer zone extends into the proposed development resulting in permanent impacts through the creation of impervious area. It appears that the proposed project will require grading within the 25-foot buffer zone and it appears that there may be filling within the wetland for the gravel access drive. Nitsch Engineering recommends that the Applicant discuss the work near the wetland line and any proposed work in the wetland that will require wetland replication.
6. The Applicant should discuss with the ZBA the limits of the designated open space or if there will be a conservation restriction within the site.
7. It does not appear that the project site is located within a Flood Zone or within protected areas designated by the Natural Heritage and Endangered Species Program (NHESP). The Conservation Memo indicates a Certified Vernal Pool, which should be located on the plan for reference.
8. The project includes the construction of seven (7) new drinking water supply wells to be shared by the proposed units. Nitsch Engineering understands that MassDEP will permit these well as a PWS. The Applicant should also discuss with the ZBA whether an Interim Well Head Protection Area (IPWA) Zone I or Zone II designation is appropriate. Nitsch Engineering understands that the ZBA is undertaking a separate peer review regarding the water and septic systems.
9. Nitsch Engineering notes that the Applicant provided an Operation and Maintenance (O&M) plan for the site. The O&M shall be included in the Home Owners Association (HOA) documents and required as part of any decision of Approval by the ZBA, if granted.
10. Because the project will disturb greater than one (1) acre of land, Nitsch Engineering understands that an Environmental Protection Agency (EPA) and National Pollutant Discharge Elimination Systems (NPDES) permit will be required. Nitsch Engineering recommends that the ZBA include a condition to

require that the Applicant submit the SWPPP for review at least 30 days prior to construction.

11. Nitsch Engineering recommends that the Applicant update the ZBA on the status of the above permits and any other required permits, including the interests of the Conservation Commission, Building Inspector, and BOH.

PROJECT LAYOUT AND SITE FEATURES

12. The Applicant is proposing a 24-foot wide, 800± linear foot private roadway to provide access to the 14 units. The proposed cul-de-sac has an outer diameter of 120 feet and an inner diameter of 70± feet. There is a 200-foot length of 20-foot driveway off the cul-de-sac that provides access to six (6) units. Then there is a gravel access road to allow for fire truck turn around and access to the seven (7) wells.
13. The Applicant provided turning movements of a fire truck at the end of the 20-foot wide driveway. The turning movements appear to indicate that the fire truck can just make the turn. However, the movements are within the driveways of Units 15 and 16. The Applicant should discuss how a fire truck can make the turn if there is a vehicle parked in the driveway. The Applicant should provide the swept turning template line work on the plans to better understand how the truck will make the turn and provide a dedicated fire truck turning area to avoid potential conflicts with resident vehicles. It appears that additional area, either paved or gravel, will be needed to allow for easier and more fluid truck turning maneuvers.
14. Nitsch Engineering recommends that the Applicant discuss with the Fire Chief whether the building spacing will require additional fire/life safety precautions. The Applicant should provide a memo to the ZBA about any additional measures requested by the Fire Chief.
15. Nitsch Engineering did not receive updated construction details as part of the information available for download. Nitsch Engineering recommends that the Applicant submit detail sheets for the proposed site and roadway components, erosion and sedimentation controls, and utility infrastructure, including site specific details for the proposed stormwater management systems, gravel access road and wetland filling and mitigation.
16. Nitsch Engineering recommends the Applicant provide a typical cross section of the roadway, driveway, gravel access drive that indicates, where proposed, the following: curb type, shoulder width, sidewalk location and width, and proposed treatments at the shoulder slopes.
17. Nitsch Engineering recommends that the Applicant indicate whether there will be any easements for maintenance of the drainage and septic utilities or for any proposed paths. Any new easements should be indicated on the plan.
18. It is not clear from the plans if the Applicant is proposing any new trails internally or create a trail connection with the Blood Farm Trail. The Applicant also proposes to construct an access road over the intermittent stream and BVW located to the east of the proposed development. Nitsch Engineering recommends that the Applicant confer with the Town Conservation Commission and Trails Committee on any proposed trails or trail connections. In particular, the proposed wetland crossing will require additional work within jurisdictional wetland resource areas. Nitsch Engineering recommends that the Applicant consider crossing the wetland/intermittent stream with a clear span to avoid impacts.
19. Nitsch Engineering recommends that the Applicant review the revised plans with the Police Department to determine if there any additional measures required by the Department for this project.
20. The Stormwater Report indicates that the project will be constructed in two (2) phases. Nitsch Engineering recommends that the Applicant provide additional information on the proposed phasing,

including the timeline for Phases 1 and 2 and the proposed phasing plan for the units, roadway, and utilities.

21. The plan indicates an entry sign. Nitsch Engineering recommends that the Applicant provide a color cut sheet of the sign design for review by the ZBA.
22. Snow storage areas are indicated on the layout plan. The snow storage areas are located outside any wetland buffer zones and appear to be adequately sized and coordinated with the landscape features.
23. Does the Applicant anticipate ledge removal? Nitsch Engineering recommends the Applicant indicate whether ledge will be removed as part of this project. If ledge removal is anticipated, the Applicant should coordinate with the ZBA on the appropriate methods and times of removal.
24. Nitsch Engineering recommends that the Applicant submit a Landscaping Plan for the project site that includes the proposed plantings and any vegetative screening around the site perimeter and between units. Nitsch Engineering recommends the use of native plant materials in the project site.
25. Nitsch Engineering recommends that the Applicant submit a Lighting and Photometric Plan to provide the proposed light locations for the roadway and housing units and to indicate the amount of light that will project onto the ground and surrounding area from the unit and site lighting.

GRADING

26. In general, the proposed roadway and housing units will require minor cuts within the existing topography, with more substantial earthwork (both cuts and fills) in the easternmost portion of the site near the proposed stormwater extended detention basin. Nitsch Engineering recommends the Applicant indicate the general cut and fill volumes for the revised development and the net increase or decrease of fill being brought to the site.

UTILITIES – GENERAL

27. Nitsch Engineering recommends that the Applicant provide rim and invert information for the proposed drainage utilities. The Applicant should provide a general utility layout as part of a general road cross-section.
28. The Applicant is proposing water lines, fire protection lines, underground propane tanks, electric service, and cable service within the project site. Nitsch Engineering recommends the Applicant indicate all utilities on the plan including size, pipe material type, and length. Nitsch Engineering recommends the Applicant demonstrate that any drain, sewer, and water line crossings do not conflict and meet adequate vertical and horizontal separation.
29. Nitsch Engineering recommends the Applicant provide the necessary dimension details for the water tank. Nitsch Engineering recommends that the Fire Chief provide comments on the adequacy of the water tank for fire suppression since the tank is being proposed as storage (up to two [2] days) for domestic use and fire suppression. Nitsch Engineering recommends that the Applicant provide anticipated

DRAINAGE/STORMWATER MANAGEMENT

To support the design of the stormwater management system, the Applicant used HydroCAD software to analyze the existing and proposed hydrologic conditions on the project site. Nitsch Engineering generally

agrees with this methodology; however, additional information is needed to confirm that the proposed design is appropriate for the site and technically feasible. Nitsch Engineering offers the following drainage comments:

30. The Applicant is proposing to implement Low Impact Development (LID) techniques for the site, including sheet flow of roadway drainage into the grass shoulders, collecting stormwater into Stormwater Buffer Zone (SBZ) structures before discharging to a forebay/bio-retention system and collecting stormwater from the 20-foot wide drive into SBZ structures before discharging into a forebay/extended detention basin. Stormwater is treated in these areas before discharging into the wetland.
31. Nitsch Engineering notes that test pits are required for the forebay/bioretenion and forebay/extended detention basin to determine estimated seasonal high ground water, groundwater elevation, ledge conditions, and textural analysis to determine infiltration rates where infiltration is proposed. Nitsch Engineering recommends that the Applicant provide the soil test pit logs for review.
32. Nitsch Engineering recommends one (1) test pit within the foundation each unit during construction, as a Condition of Approval, to confirm that the soils can infiltrate the roof run-off as designed for the units. Nitsch Engineering recommends that the Applicant provide these soil logs to the Building Inspector for review.
33. The Pre- and Post-Development Maps should be adjusted to include the area east of the wetland to account for the new gravel access road to wells 4, 5, 6, and 7. The Applicant should update the HydroCAD model to reflect the new area and cover type. The Pre- and Post-Development areas should be within 500 square feet of each other.
34. Based on the NRCS Soil Map, a hydrologic soil group (HSG) of "C" was used by the Applicant in the HydroCAD model for land cover types for both the Pre- and Post-Development conditions. The Applicant used the lowest allowable infiltration rate of 0.17 inches per hour for the bio-retention system. Nitsch Engineering notes that this is a conservative approach to the drainage design.
35. The Applicant is providing re-charge for the 0.5-inch storm event. Nitsch Engineering recommends that the Applicant provide recharge for up to the 1-inch storm given the number of wells and concerns expressed by the Town Conservation Commission of groundwater recharge in relation to the wetland. Nitsch Engineering notes that if soil test pits indicate soils with an infiltration rate of 2.41 inches per hour or faster, the stormwater system must infiltrate the 1-inch storm. This infiltration rate also applies to discharges to critical areas such as a Vernal Pool. The Applicant should discuss with the ZBA whether these thresholds are met for the site.
36. The Applicant provided stormwater rate reductions in the Post-Development Condition as required. While not required under the Stormwater Regulations, Nitsch Engineering also recommends that the Applicant provide stormwater volume reduction from the Pre- and Post-Development conditions.
37. The Applicant should clarify if any of the roadways will have curbing to channel stormwater to the SBZ structures. The Applicant should provide a cross-section of the roadway where curbing is proposed.
38. Nitsch Engineering recommends that the Applicant provide closed drainage calculations for the stormwater drainage pipes to the proposed basins.
39. The Applicant must provide drainage calculations that indicate that the water quality storm (0.5-inch or 1-inch) is captured and held within the proposed extended dry detention basin for 24-hours. Additional calculations are required to meet Standard 2 for retaining the pre-development peak flow as noted on page 52, Volume 2, Chapter 2 of the Stormwater handbook.

MASSDEP STORMWATER MANAGEMENT STANDARDS

Standard 1: No new untreated storm water conveyances to wetland resources area.

Based on the information provided, it does not appear that this Standard has been met. Additional information is required under items #32, 33, 35, and 39, at a minimum.

Standard 2: Storm water management systems must be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates.

Additional information is required to determine if Standard 2 is being met by the redesign as discussed under item #39.

Standard 3: Annual recharge to groundwater.

As previously noted, additional soil test pit information is needed to verify the soil texture, infiltrative capacity, and groundwater conditions within the proposed infiltration Best Management Practices (BMP). Therefore, additional information is needed to determine if Standard 3 is being met by the proposed design.

Standard 4: For new development, storm water management systems must be designed to remove 80% of the average annual load (post-development conditions) of Total Suspended Solids (TSS).

The proposed stormwater treatment appears to comply with the 80% TSS removal prior to discharge to an infiltration practice based on the current design.

Nitsch Engineering also recommends that the Applicant confirm whether the project is subject to a 0.5-inch or 1.0-inch water quality volume related to discharge to critical areas (vernal pools within the receiving wetland) or infiltration within highly permeable soils (permeability rate of 2.41 inches per hour or greater). This Standard has been met with the current design.

Standard 5: Storm water discharges from areas with higher potential pollutant loads require the use of specific storm water management BMPs. The use of infiltration practices without pretreatment is prohibited.

Not applicable.

Standard 6: Storm water discharges to critical areas must utilize certain storm water management BMPs approved for critical areas.

The Applicant should confirm that there are no resources identified as critical areas by MassDEP (i.e., vernal pools, wellhead protection areas, etc.) associated with the wetland resource area receiving the project's stormwater.

Standard 7: Redevelopment of previously developed sites

Not applicable.

Standard 8: Erosion and sediment controls must be implemented to prevent impacts during construction or land disturbance activities.

No erosion controls are provided on the plans. The Applicant does not show adequate perimeter erosion controls, inlet protection, stabilized construction entrances, or the details associated with these practices. Nitsch Engineering recommends the erosion control be shown on the plan and coordinated with the Town Conservation Commission Agent prior to construction. A Stormwater Pollution Prevention Plan (SWPPP) must be submitted prior to construction. Based on the information provided, it does not appear that this Standard has been met.

Standard 9: All storm water management systems must have an Operations and Maintenance Plan to ensure that systems function as designed.

A schedule for the operation and maintenance of the proposed stormwater management system was included in the Stormwater Report. While Nitsch Engineering does not take exception to the submitted material, there may be additional changes to the O&M Plan based on previous comments. This Standard has been met.

Standard 10: Prohibition of Illicit Discharges.

The Stormwater Report provided by the Applicant indicates that an Illicit Discharge Statement will be provided prior to construction. Nitsch Engineering recommends that the ZBA include a Condition to require the submittal of the Illicit Discharge Compliance Statement for review at least 30 days prior to the start of construction.

ZONING BY-LAW

1. The Applicant is proposing a 20-unit housing development on a single lot in the Residence District B. Nitsch Engineering notes that the resulting density is 2.03 units per acre. The plan indicates that the proposed units are separated by a minimum of 20 to 25 feet. The Fire Department recommends a 30-foot separation. Nitsch Engineering recommends that the Applicant discuss with the ZBA why a 30-foot separation between units cannot be met and if there are any mitigation measures proposed for units spaced closer than 30-feet.
2. Nitsch Engineering recommends that the Applicant provide a Landscaping Plan to the ZBA that includes vegetative screening along the west property line.

SUBDIVISION RULES AND REGULATIONS

3. Nitsch Engineering recommends that the Applicant submit a Landscape Plan for the project site that includes the proposed plantings within the site and the vegetative screening around the site perimeter including between units. Nitsch Engineering recommends the use of native plant materials in the project site.
4. Nitsch Engineering recommends that the Applicant provide a profile of the roadway, cul-de-sac, and driveway for the proposed project for review to understand the proposed roadway slopes and vertical curves are appropriate.

SUMMARY

Based on the information submitted for the proposed project at 100 Long Ridge Road, Nitsch Engineering notes that the current design does not appear to be in compliance with the DEP Stormwater Standards. The Applicant should also provide additional information on the following:

1. Utility layout locations within the site (water, sewer, propane, electric, cable, etc.);
2. General roadway cross-sections (curb or no curb);
3. Roadway Profile (confirm roadway grades are appropriate);
4. Landscape Plan for the site perimeter and within the site;
5. Additional drainage calculations for the Extended Detention Basin and additional calculations for stormwater infiltration/volume control as recommended or required by the Stormwater Handbook if the site is considered an IWPA or has a discharge to a Critical Area;
6. Provide erosion control measure for the site, especially for the new well installations;
7. Provide more detail of the wetland filling and replication – a clear span over the wetland is recommended. Provide a mitigation plan for work in the Wetland Buffer Zone;
8. Provide stamped NOI, Stormwater Checklist, and revised Calculations for review; and
9. Provide additional area for the fire truck turning location at the end of the driveway and start of the gravel access.

We look forward to meeting with the ZBA at the next hearing scheduled to further discuss this project.

Very truly yours,

Nitsch Engineering, Inc.



Steven Ventresca, PE, LEED AP BD+C
Project Manager

SV/aab